

Name \_\_\_\_\_



## Measuring Lung Capacity

**Background Information:** We need a constant supply of oxygen in order to stay alive. We use oxygen to break down food to release energy and produce carbon dioxide as a waste product. We need to continually take in oxygen from the air and expel carbon dioxide into the air.

The respiratory system functions to filter, warm, and humidify the air we breathe, and to supply cells with oxygen while removing carbon dioxide.

Air moves into the lungs through the trachea and then back out again. When each breath is completed, the lung still has some air, called the residual volume. Each inhalation adds additional air. **Each exhalation removes about the same volume as was inhaled.**

The amount (volume / capacity) of air in the lungs can be measured several ways:

- ☞ **TOTAL LUNG CAPACITY** – the amount of air in the lungs after a deep *inhalation*; The vital capacity plus the residual volume
- ☞ **RESIDUAL LUNG CAPACITY** – the amount of air left in the lungs after a deep *exhalation*
- ☞ **VITAL LUNG CAPACITY** – the amount of air exhaled in one breath; The maximum amount of air that can be forcibly exhaled after breathing in as much as possible.
- ☞ **TIDAL LUNG CAPACITY** – The amount of air your lungs hold during normal breathing; the amount of air moved in and out of the body in one breath

Lung capacities or volumes differ with age, sex, body frame and aerobic fitness.

Measuring your lung capacity can help you determine how much stamina you have available to go about your daily routine, include sports and other activities.

Usually you need about 1/3 of your lung capacity to carry out routine tasks that do not require exertion.

It is also possible for you to increase your lung capacity through regular exercise.

Your lung capacity may be affected by certain disorders such as asthma and emphysema.

Cigarette smoking will give you noticeable signs of emphysema after only three years of use. Such things as altitude, the position your body is in, air temperature, weather conditions, and air pollution may also contribute to a decrease in lung capacity.

Volume or capacity is measured in liters (l), milliliters (mL) and cubic centimeters (cm<sup>3</sup>). One mL is equal to one cm<sup>3</sup>.

The amount of air that you move in and out of your lungs while breathing normally is called **TIDAL CAPACITY**. This amount of air gives enough oxygen for a person who is resting.

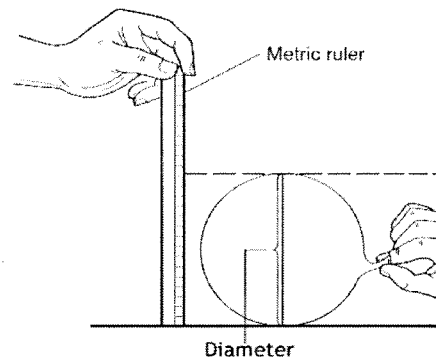
It is possible to inhale and exhale more forcefully - the maximum amount of air moved in and out of the lungs is called the **VITAL CAPACITY**.

Materials:

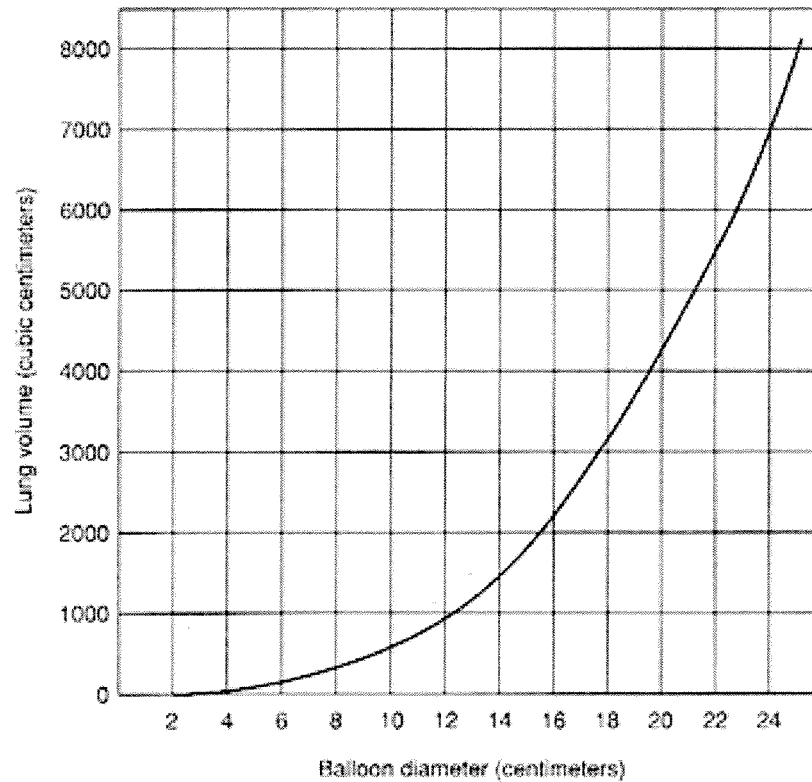
|         |              |
|---------|--------------|
| Balloon | Metric ruler |
|---------|--------------|

Procedure:

1. Measure your **Tidal Capacity** --
  - a. Stretch a round balloon several times to stretch it out.
  - b. Inhale normally and then exhale normally into the balloon.
  - c. Pinch the end of the balloon and measure its diameter. Record the data. See diagram:
  - d. Repeat for a total of 5 measurements. Record the data.



2. Measure your **Vital Capacity** –
  - a. Repeat step 1 of the procedure, only this time inhale and exhale as much air as you can.
3. Use the graph below to convert the balloon diameters to volume. Record.



Data:

|         | Tidal Capacity           |                       | Vital Capacity           |                       |
|---------|--------------------------|-----------------------|--------------------------|-----------------------|
|         | Balloon<br>Diameter (cm) | Volume of air<br>(cc) | Balloon<br>Diameter (cm) | Volume of air<br>(cc) |
| Trial   |                          |                       |                          |                       |
| 1       |                          |                       |                          |                       |
| 2       |                          |                       |                          |                       |
| 3       |                          |                       |                          |                       |
| 4       |                          |                       |                          |                       |
| 5       |                          |                       |                          |                       |
| Average |                          |                       |                          |                       |

### Questions & Conclusions:

1. What is meant by *lung capacity*?
2. Compare your data to other members of your group. How can you account for differences?
3. How might an athlete's vital capacity compare to a non-athlete? Explain your reasoning.

### Application:

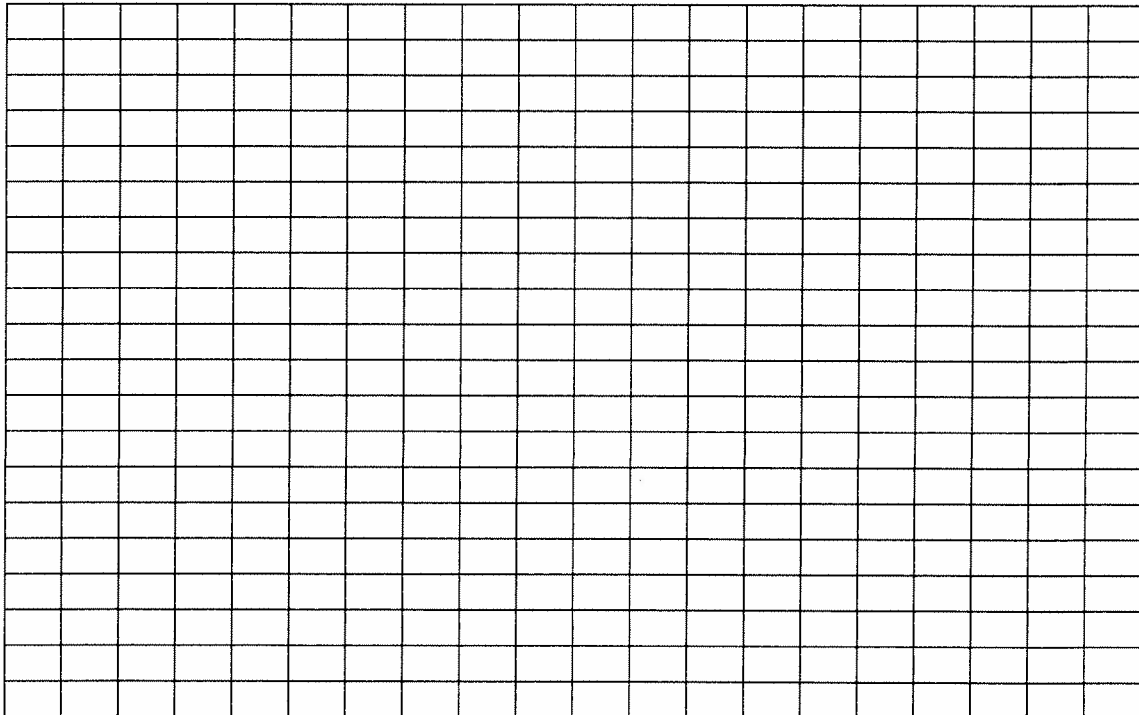
Examine the data table of a person who entered into a training program. This person's vital capacity was measured over a 60 day period. Graph the data.

| Training Data |                |
|---------------|----------------|
| Training Day  | Vital Capacity |
| 0             | 4800           |
| 10            | 4840           |
| 20            | 4890           |
| 30            | 4930           |
| 40            | 4980           |
| 50            | 5180           |
| 60            | 5260           |



Give your graph a title

Label both axes with labels and units



1. What happened to the person's vital capacity over the course of the training period?

2. What probably caused the change? EXPLAIN YOUR ANSWER.

3. How might vital capacity be important to a musician? EXPLAIN YOUR ANSWER